# AC Curezyme

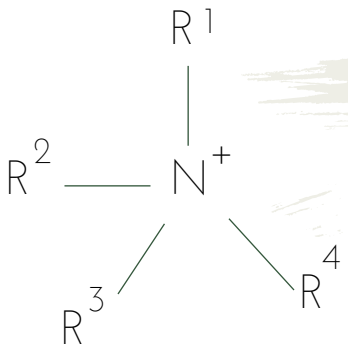
Collaboration by:
Curie Co and Active Concepts, LLC

INCI: Vegetable Protein Keratinoligase

Active Concepts

# Historic Haircare

Quaternary ammonium compounds, or quats, have been a staple in haircare for decades due to their detangling, conditioning, and anti-static properties. Their benefits stem from their positively charged nature, which allows them to adhere to the negatively charged sites on hair, particularly in damaged and porous areas.




Quaternary ammonium compounds are characterized by a central nitrogen atom bonded to four organic groups.

# Quats Through Time

| | |
|---|---|
| 1950s – 1960s | Superior Conditioning & Detangling: Quats, particularly cetyltrimethylammonium chloride (CTAC) and stearyltrimethylammonium chloride (STAC), became widely used in creme rinses and hair conditioners. Alkyldimonium was used as a staple for detangling and softening. |
| 1970s – 1980s | Anti-Static & Frizz Control: With the rise of blow-drying and heat styling, quats like behentrimonium chloride (BTAC) helped reduce flyaways and static. |
| 1990s – 2000s | Improved Wet & Dry Combing: Quats like hydroxylpropyltrimonium were promoted as more environmentally friendly and suitable for 2-in-1 shampoos and lighter conditioners. Their ability to improve wet combing (reducing breakage when hair is most vulnerable) and dry combing (enhancing smoothness) was widely recognized. |
| 2000s – 2010s | Color Protection & Damage Repair: They helped seal the cuticle, reducing moisture loss and preventing fading of hair dye. |

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# Quaternized Proteins

Quaternized proteins, also called cationic or quaternary protein derivatives, are hydrolyzed proteins (like **keratin, silk, wheat, or collagen**) chemically modified with quaternary ammonium groups to make them positively charged.

These quaternized proteins became commonplace in salon-grade and commercial products. Silk, wheat, and keratin quats surged in popularity due to **consumer recognition**, compatibility with both rinse-off and leave-on formulations, and their perceived "**natural + scientific**" blend.

# Issues on the Rise

While traditional quats *and* quaternized proteins are commonly used in haircare for conditioning, detangling, and frizz control, they come with some drawbacks that started to be addressed by consumers:

- **Buildup on Hair**: Some quats, especially non-biodegradable ones, can accumulate on hair over time, leading to heaviness and reduced efficacy of hair treatments.
- **Scalp Irritation**: Certain quats may cause scalp sensitivity, itching, or irritation.
- **Environmental Concerns**: Many traditional quats are not readily biodegradable and can be toxic to aquatic life.
- **Ineffective on Highly Damaged Hair**: While quats provide a temporary smoothing effect, they don't repair underlying structural damage. They still need… bond-builders.

# Bond-Builder Background

While quats are surface-level solutions, bond-builders in haircare highlight the shift towards a deeper, more reparative approach. These science-backed solutions add versatility in both professional and consumer haircare, with a strong focus on preventative, sustainable, and ethical practices.

Key advancements in bond-building haircare focus on innovation and accessibility, with significant trends including integrated formulas, convenient at-home solutions, enhancements for natural strength, and multifunctional products that combine bond repair with additional benefits.

# Sound familiar?

Some popular market examples include Olaplex®, K18 Biomimetic Hairscience, and the Redken Acidic Bonding Concentrate!

# Strengthen, Repair, Protect

Heat styling, chemical treatments, and environmental stressors can weaken the hair's internal structure, leading to increased breakage, dullness, and severe loss of elasticity.

Bond-building technology works at the molecular level to restore and reinforce hair integrity. By targeting and repairing broken disulfide, hydrogen, and ionic bonds, these advanced actives help to rebuild hair strength, improve resilience, and enhance manageability.

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# Curamina®

Curamina® is a dual-action bioactive from Curie Co, a biotech innovator based in Durham, North Carolina. Designed for holistic haircare, this active seamlessly integrates with protein ingredients to elevate performance.

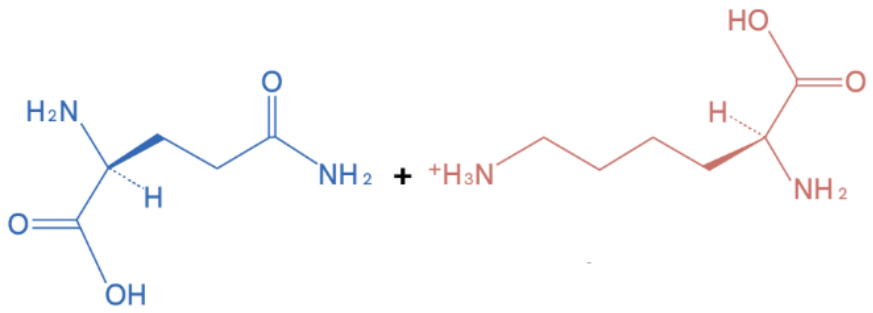
This powerhouse ingredient creates essential peptide bonds while delivering long-lasting, water-resistant, film-forming properties that protect and strengthen all hair types.

Designed to mimic an enzyme naturally found in skin and hair follicles, Curamina® uses proprietary technology to evolve beyond common enzymes, fine-tuned for effectiveness.

# Peptide Bonds

Curamina® initiates new peptide bonds, linking lysine and glutamine. These bonds create the strongest covalent bonds in the hair fiber, essential for hair structure and strength.

When paired with protein ingredients, Curamina® "glues" the protein to the hair fiber and seals in the benefits, reducing rinse off and potentially boosting efficacy performance across the spectrum of haircare, *without the need for quaternization*.




*Transglutaminases*. (n.d.). Labster Theory Pages. https://theory.labster.com/transglutaminase/

Active Concepts

# AC Hydrolyzed Vegetable Protein PF

Active Concepts' portfolio includes a plethora of advanced proteins, including AC Vegetable Protein PF, a cutting-edge, plant-derived alternative to traditional animal-based proteins like keratin. This ingredient harnesses hydrolyzed wheat, soybean, and corn proteins, which have been broken down into a lower molecular weights for enhanced penetration and efficacy.

Widely used in cosmetics, hydrolyzed vegetable protein (HVP) is celebrated not only for its versatility in formulation but also for its ability to deliver powerful conditioning, shine enhancement, and frizz control — all while supporting sustainable and cruelty-free beauty. As consumers and brands shift toward ethical, plant-powered solutions, AC Hydrolyzed Vegetable Protein PF offers a modern approach to nourishing, strengthening, and protecting the hair fiber without compromise.

# Sourcing

*AC Hydrolyzed Vegetable Protein PF is derived from corn, wheat, and soy. The corn is sourced from the USA, Italy, and Thailand. Wheat and soy are sourced from the USA, Italy, and Japan.*

## USA

*Corn, wheat, and soy are sustainable crops for many farms because they aid as crop rotation plants. Crop rotations assist in reducing soil erosion while increasing soil fertility.*

## Italy

*Our suppliers adhere to upholding the well-being of their employees through fair pricing and premium funds that go towards social, economic, and environmental maintenance. These donations include school construction, health care facilities, and regional infrastructure.*

## Thailand / Japan

*Curamina® (Water & Glycerin & Transglutaminase) is manufactured in the USA or Europe.*

# Introducing AC Curezyme

AC Curezyme is an innovative hybrid that presents the industry with an intersection of quaternization and bond-building.

- More Than Just Conditioning — It's Bioactive Strength: Unlike traditional quats that only coat the hair for smoothness, AC Curezyme penetrates the hair fiber, reinforcing the hair while delivering long-lasting hydration and frizz control.
- Smart Protein Technology for Weightless Protection: The low molecular weight from the hydrolyzed proteins allow for deeper absorption, improving resilience without buildup — ideal for all hair types.
- Sustainable, Plant-Based Alternative: By tailoring Curamina® to enhance the activity of a plant-based alternative like AC Vegetable Protein PF, we are leveraging a modern conditioning system that aligns with beauty trends.

# Benefits

Active Concepts

- **AC Curezyme** boosts the performance of conditioning systems by reinforcing their bond with the hair, helping lock in moisture and smoothness. Even better? It does it all without buildup!

- **AC Curezyme** shields the hair from the damaging effects of airborne pollutants by helping preserve vital proteins.

- **AC Curezyme** delivers style-holding benefits in high humidity and visibly reduces frizz. Preserving natural and styled curl patterns, this dual-action bioactive transforms the entire hair experience.

- **AC Curezyme** introduces an advanced enzyme-to-protein ratio tailored for the evolving, post-quat haircare market.

*Enzymatic hydrolysis of corn, wheat, and soy*

*Engineering with Curamina®*

*Addition of Leuconostoc/Radish Root Ferment Filtrate*

# AC Curezyme

*Mechanical processing of Zea Mays, Triticum Aestivum, and Glycine Max*

## *Manufacturing Process.*

Active Concepts

# Market Insights

Many brands are incorporating quaternized proteins and bond-builders in their products. The protein market (*which would include quaternized proteins as a subcategory*) is projected to reach $3.32 billion in 2029, with a CAGR of 9.6%. The bond-building haircare market is projected to value $442 million by 2030, driven by a CAGR of 9.3%.

Many modern haircare products feature formulations that combine bond-building mechanisms with quaternized proteins. What sets AC Curezyme apart?

- *One* ingredient. *Two* layers of defense.
- Dual-function care that rebuilds bonds *and* restores the hair's outer armor
- Bioengineered repair without buildup
- Cortex-to-Cuticle Restoration
- Next-Gen Conditioning for a Post-Quat Market

# Available Efficacy Studies

## Ex Vivo.

- Hair Substantivity
- Airborne Pollution Protection (alone vs. Hydrolyzed Vegetable Protein)
- Curl Retention (alone vs. Hydrolyzed Vegetable Protein)
- Humidity Protection (alone vs. Hydrolyzed Vegetable Protein)
- UV Hair Protection
- Tensile Strength
- Color Protection

## In Vivo .

- Salon Half-Head Study
  - AC Curezyme vs. Base
  - AC Curezyme vs. AC Hydrolyzed Vegetable Protein PF
  - AC Curezyme vs. AC Quaternized Plant Keratin PF

# Hair Substantivity

*The Mechanism.*

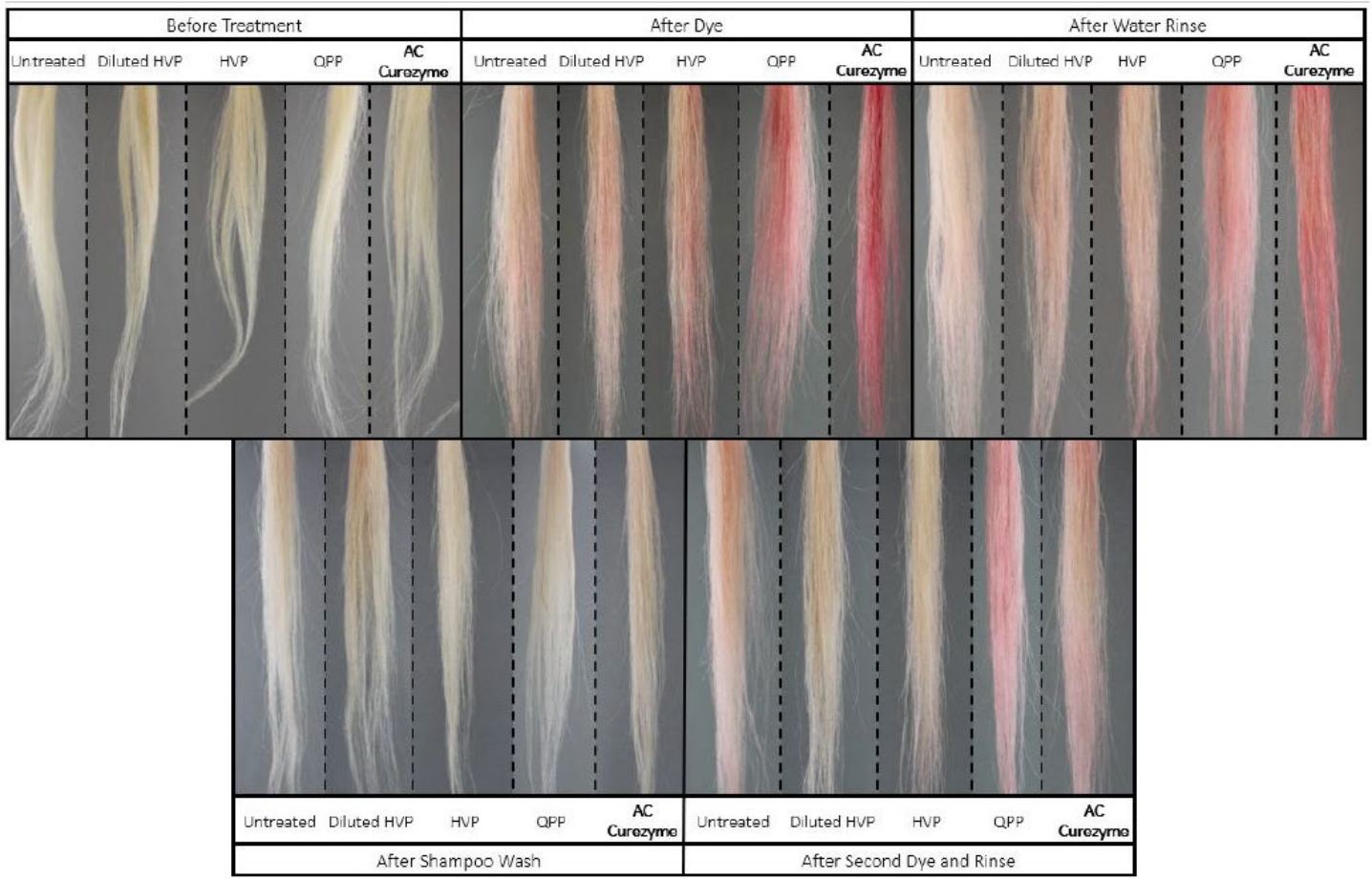



Figure 1. Comparison Chart Demonstrating the Influence of AC Curezyme on Hair. Each Image Left to Right: Untreated Control, Diluted HVP, QPP, AC Curezyme.

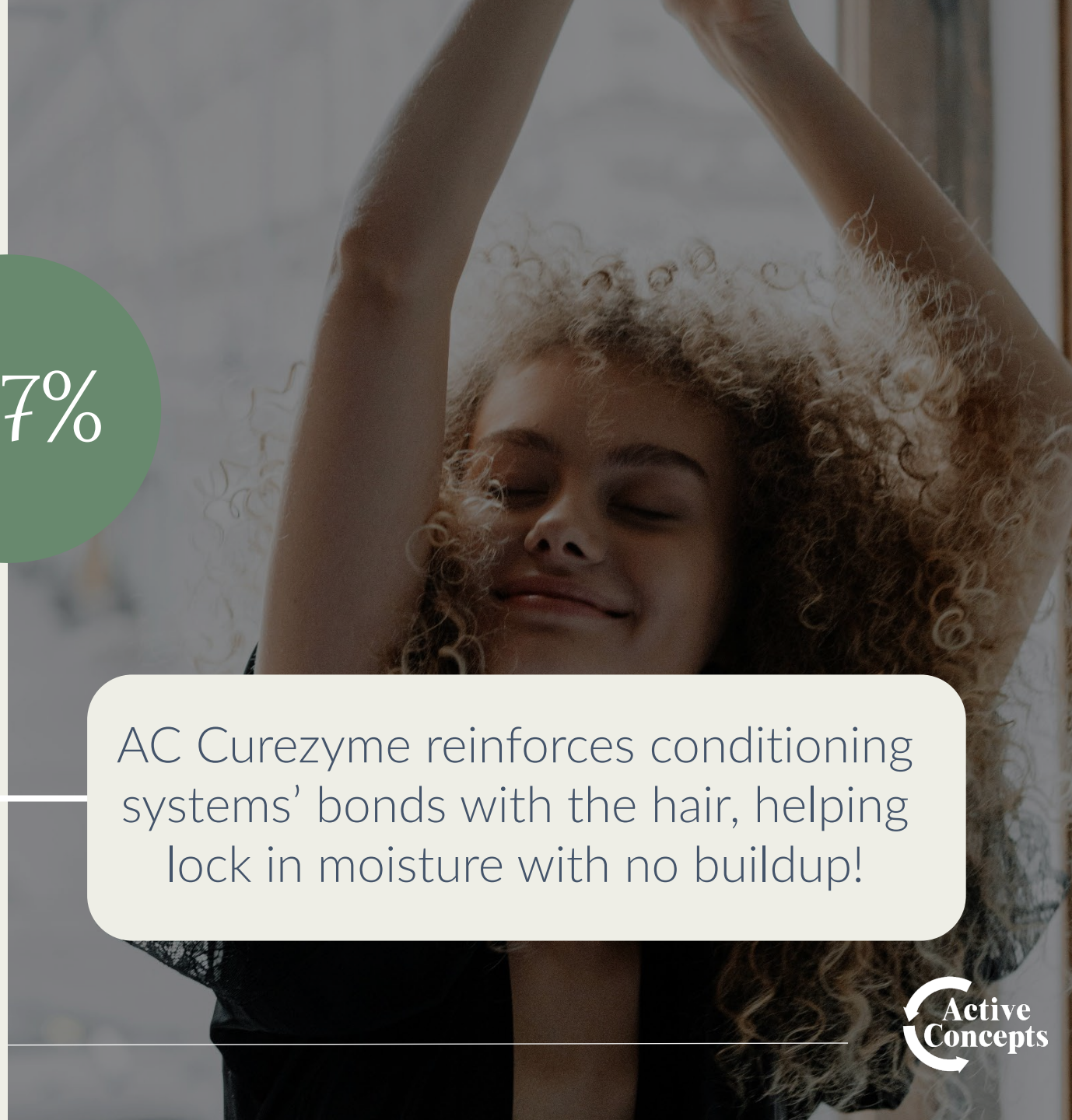
To assess the substantivity of AC Curezyme, a modified Rubine Red Test was performed on virgin blonde hair tresses. Tresses were stained, rinsed, shampooed, and re-stained to assess both deposition strength (color retention after rinsing) and washability (removal after shampooing without residual buildup). Color intensity and retention served as indicators of product substantivity, while repeated dyeing cycles evaluated potential accumulation on the hair.

2.0% AC Curezyme significantly increased hair substantivity by

+57%

# Benefits

AC Curezyme reinforces conditioning systems' bonds with the hair, helping lock in moisture with no buildup!



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# Airborne Pollutants

*The Protection.*

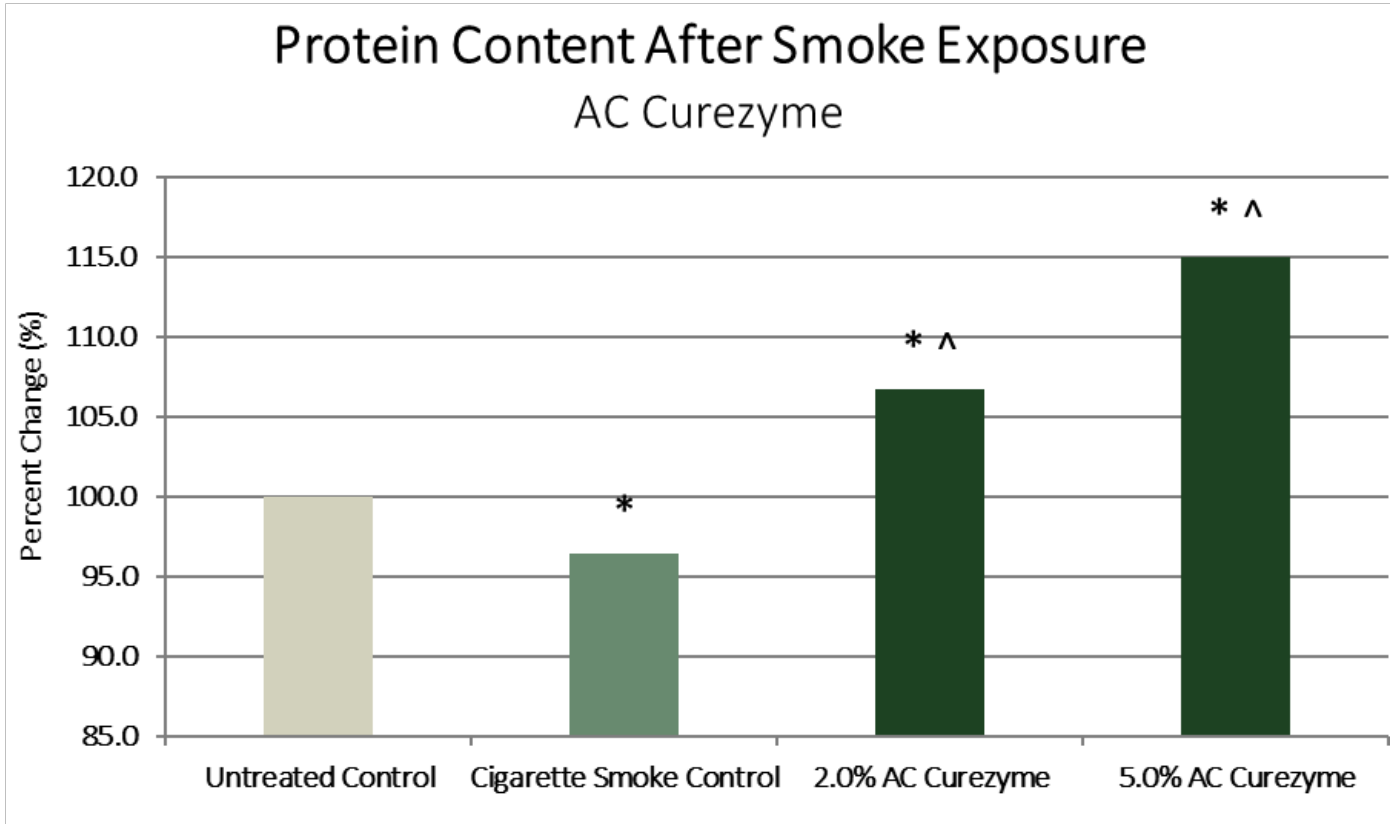


Figure 2. Percent Change in Tryptophan after Smoke Exposure Relative to Untreated Control Hair Tresses. * indicates significance ($p \leq 0.05$) compared to Untreated Control. ^ indicates significance ($p \leq 0.05$) compared to Smoke Control.

To evaluate AC Curezyme's protective benefits, virgin brunette hair tresses were treated with water, 2.0% or 5.0% AC Curezyme, or left untreated. All but the untreated control were exposed to controlled cigarette smoke for one hour. After exposure, tresses were shampooed, dried, and analyzed for tryptophan degradation via fluorescence spectroscopy.

Tresses treated with 5.0% AC Curezyme had more tryptophan compared to the cigarette smoke control hair tresses by

+18.6%

# Benefits

AC Curezyme defends against pollution-induced damage, perfect for modern, urban haircare.

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# Curl Retention

*The Protection.*


Figure 3. Representative Images of Curl Retention at High Humidity Over Time.

To assess the style-holding benefits of AC Curezyme, a Hair Curl Retention Assay was performed using virgin brunette hair tresses. Each tress was treated with either DI water or 2.0% AC Curezyme, then curled overnight with heatless curlers for consistency. Tresses were evaluated under ambient and high humidity conditions overtime. Curl retention was tracked through photography and measured using scale paper to calculate percent curl retention.

Tresses treated with 2.0% AC Curezyme increased curl retention 4 hours after humidity exposure by

+29%

# Benefits

AC Curezyme empowers curls to go the distance, delivering proven style-holding benefits even in high humidity.

Active Concepts

# Humidity Protection

*The Protection.*

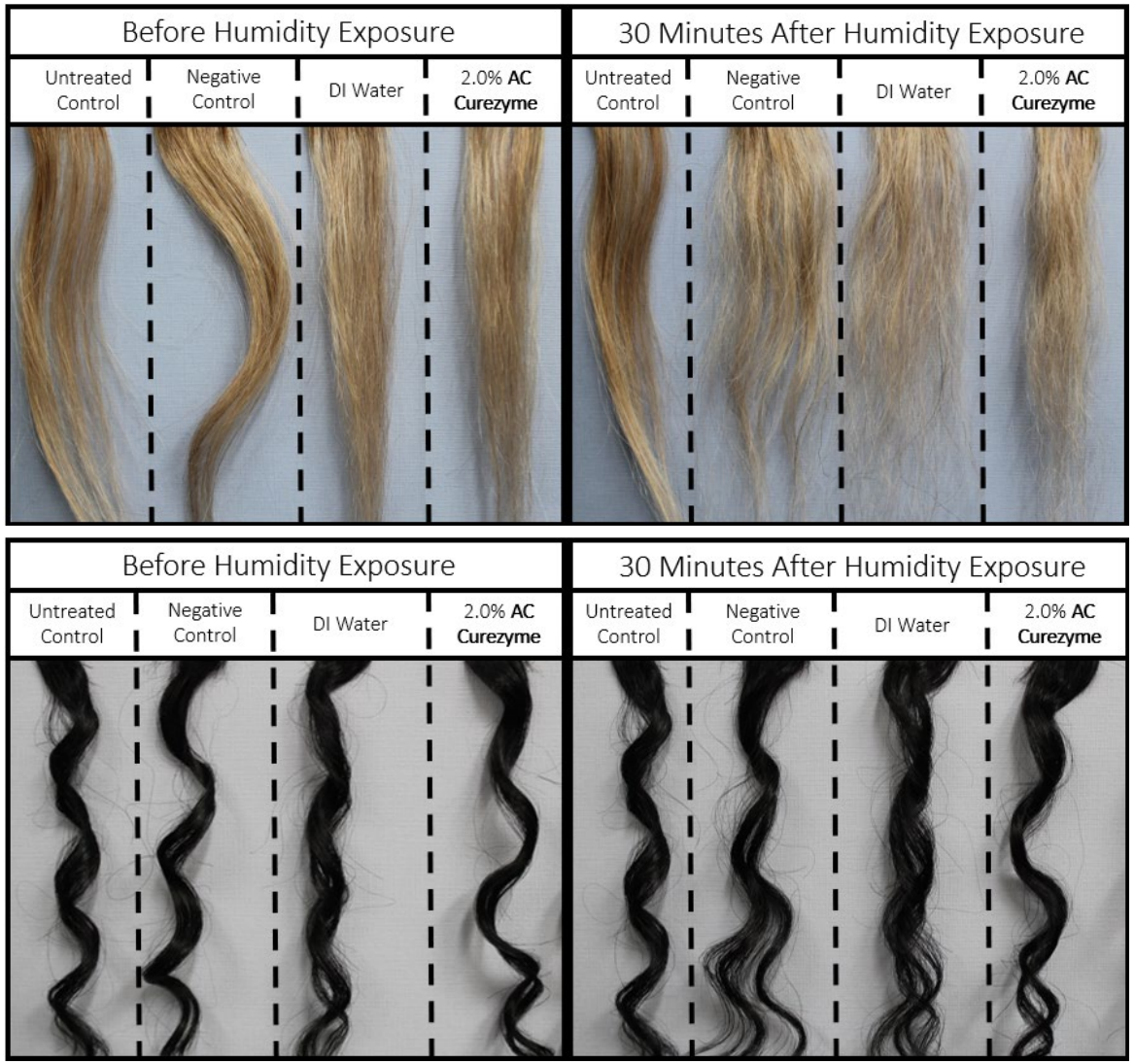



Figure 4. Top: Before and 30 Minutes After Humidity Exposure in Bleached Hair Tresses. Bottom: Before and 30 Minutes After Humidity Exposure in Curly Hair Tresses.

A Humidity Protection Analysis was performed to assess the protective benefits of AC Curezyme. Twelve tresses (bleached, virgin, and curly) were treated with DI Water, 2.0% AC Curezyme, or left untreated. Tresses were dried, imaged, and then exposed to high humidity in a closed chamber. Final images were captured after 30 minutes to evaluate frizz and smoothness.

Positive qualitative results were observed for protecting each of the tresses from humidity, making them appear smooth and shiny!

Positive!

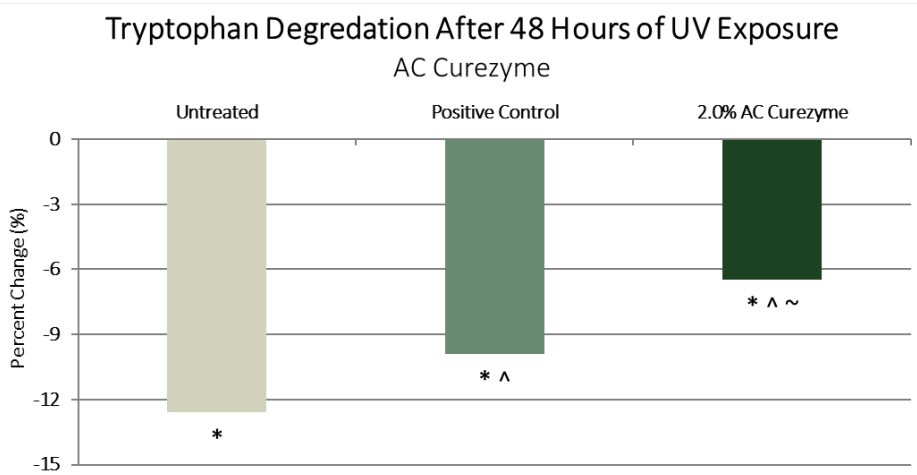
# Benefits

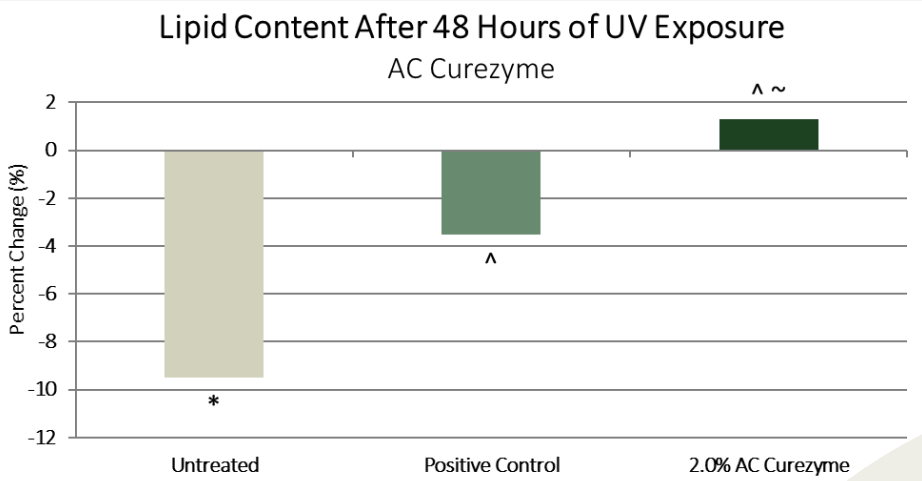
AC Curezyme visibly reduces frizz, tames volume, and preserves natural curl patterns.

Active Concepts

# UV Protection

*The Protection.*



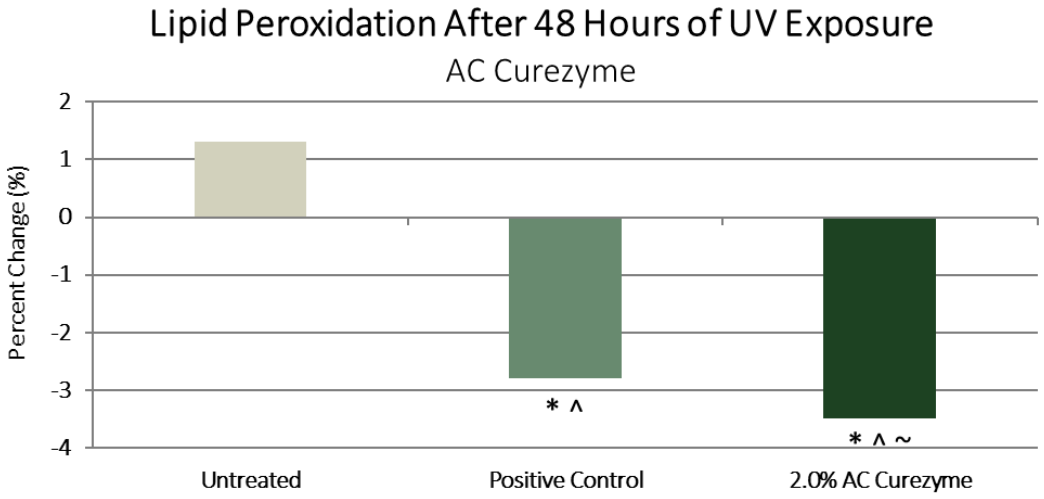




Figure 5. Top Left: Percent Change in Tryptophan After 48 Hours of UV Exposure. Top Right: Percent Change in Lipid Content After 48 Hours of UV Exposure. Bottom: Percent Change in Lipid Peroxidation After 48 Hours of UV Exposure.

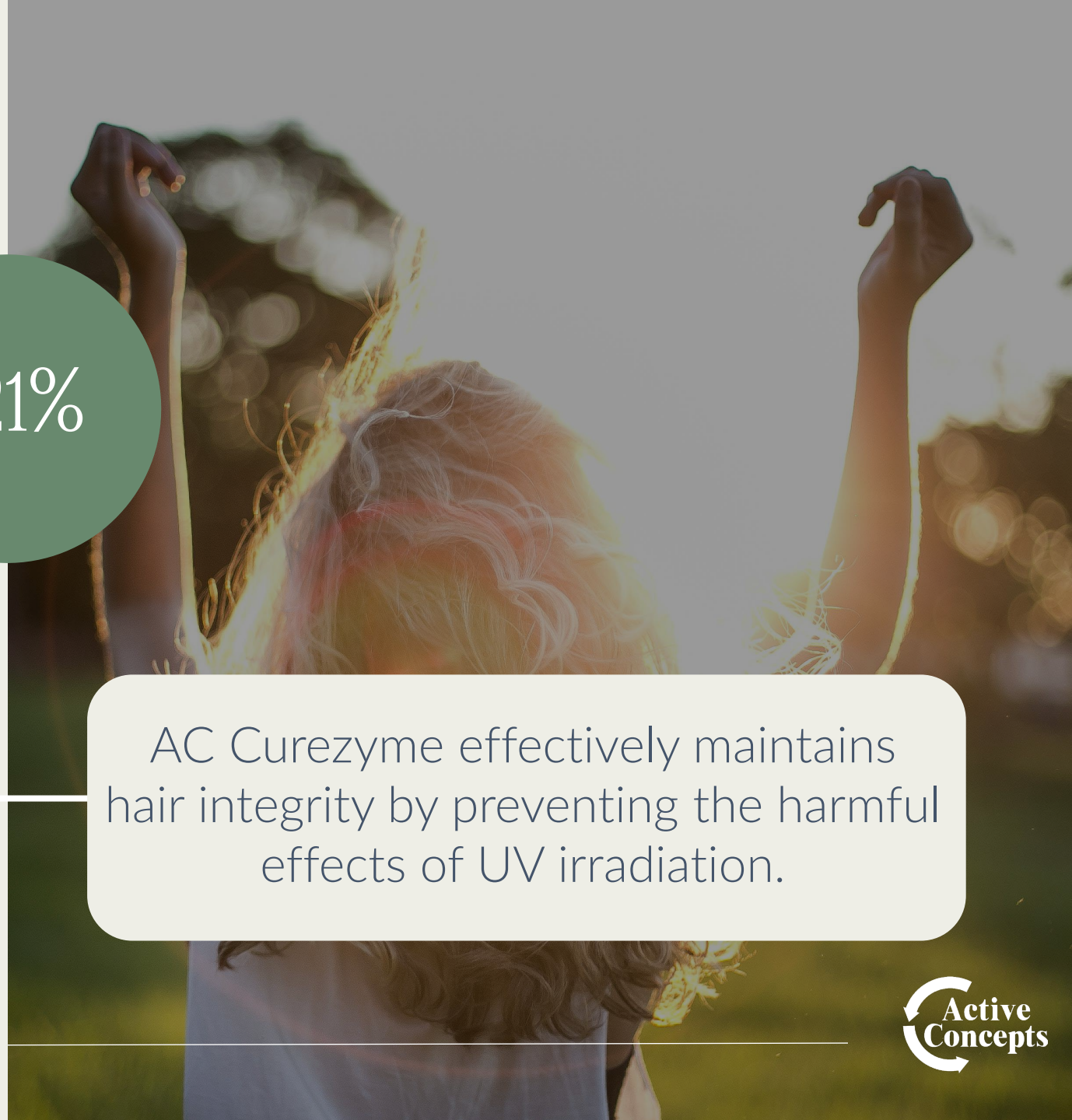
Virgin brunette tresses were dampened, treated with 0.4g of AC Curezyme or control formulations, air-dried, and either kept in the dark or exposed to 48 hours of UVB. After irradiation, hair proteins and lipids were extracted and 3 complementary markers of photo-damage were quantified: (i) tryptophan, (ii): total lipid content, and (iii): formation of malondialdehyde-based lipid peroxides.

2.0% AC Curezyme reduced lipid peroxidation when compared to the untreated control by

**-21%**

# Benefits

AC Curezyme effectively maintains hair integrity by preventing the harmful effects of UV irradiation.



Active Concepts

# Color Protection

*The Protection.*

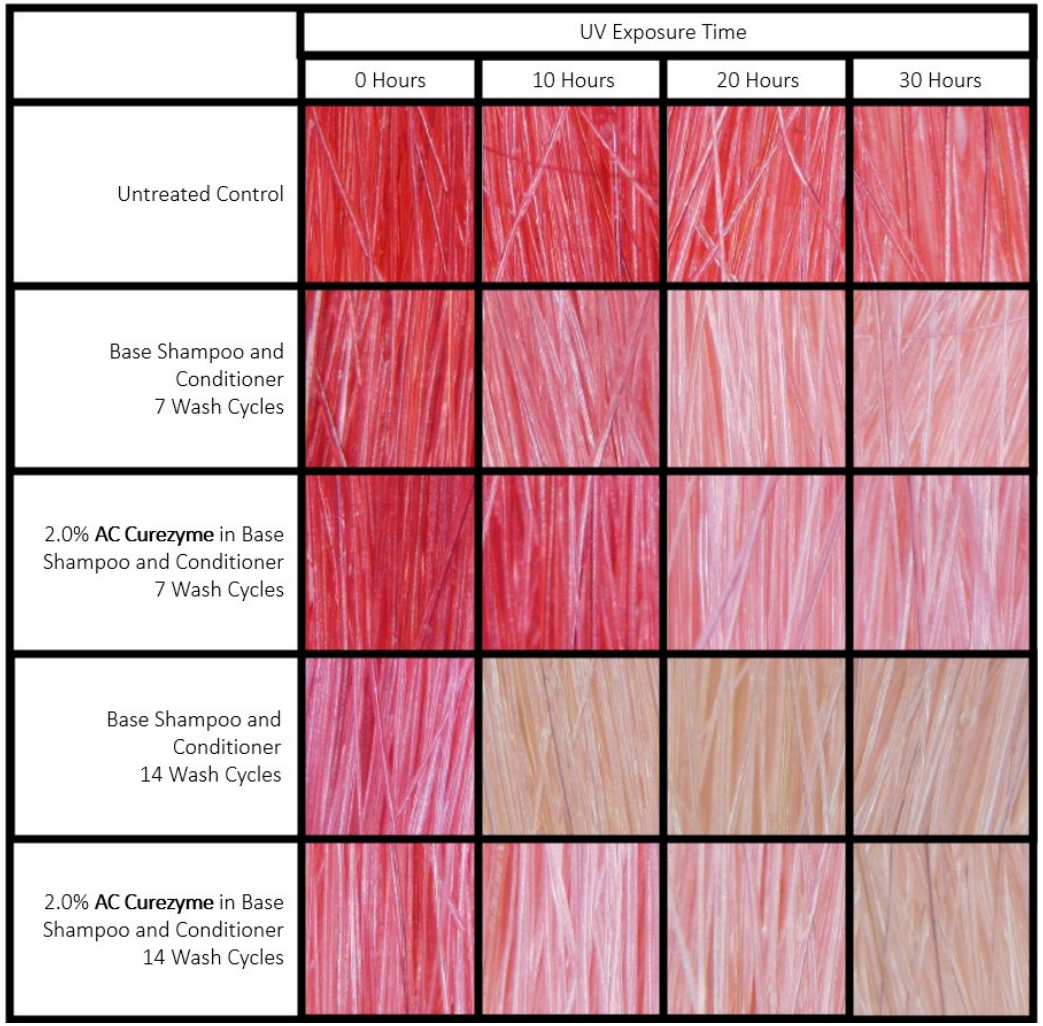



Figure 6. Representative Microscopy Images of Color-Fade Demonstrating the Influence of UV Exposure and Number of Wash Cycles on Hair Colorfastness.

Red-dyed blonde hair tresses were subjected to multiple wash cycles and UV exposure. Tresses were treated with either base shampoo and conditioner, the same base with 2.0% AC Curezyme, or left untreated. Color intensity (CIELab*) was measured before treatment, after 7 and 14 washes, and following 0, 10, 20, or 30 hours of UV exposure using Xenon-Arc light to simulate sunlight. Microscopy and color analysis revealed that AC Curezyme-treated hair tresses retained color more effectively and showed less structural damage.

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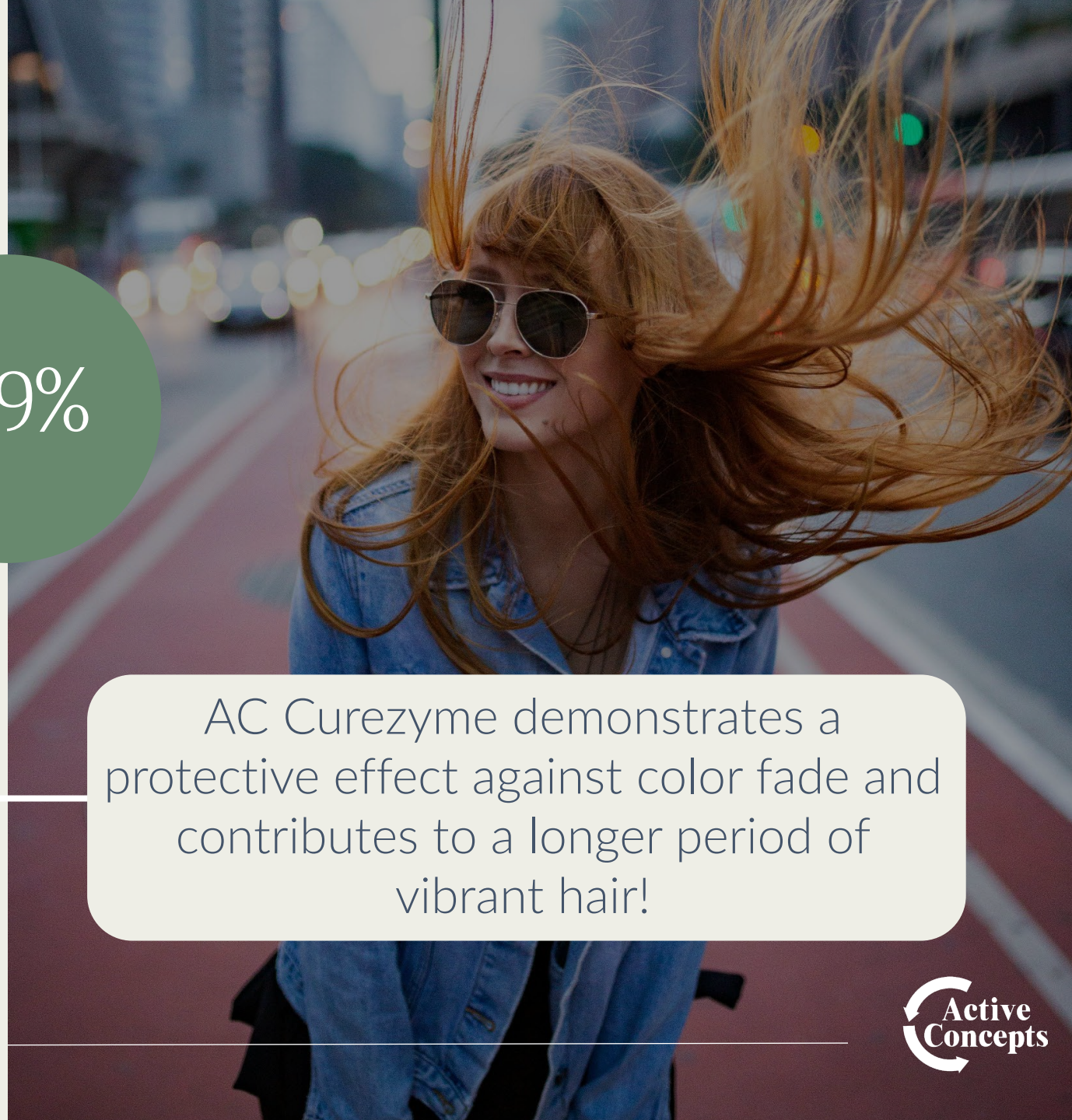
2.0% AC Curezyme reduced color change after 14 washes and 30 hours of UV radiation by

-79%

# Benefits



AC Curezyme demonstrates a protective effect against color fade and contributes to a longer period of vibrant hair!

Active Concepts

# Tensile Strength

*The Strength.*

## 3B-Curly-Black

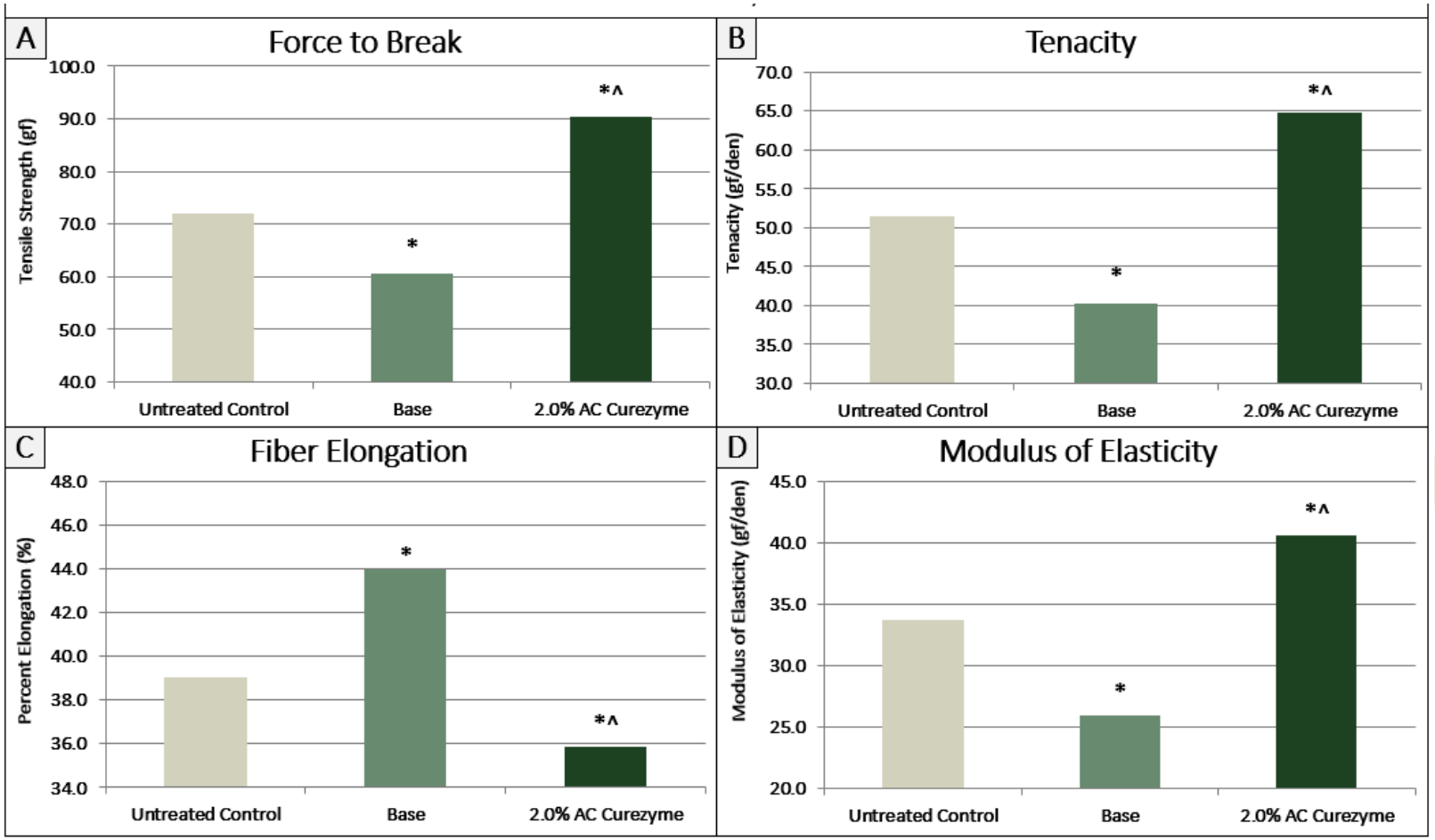


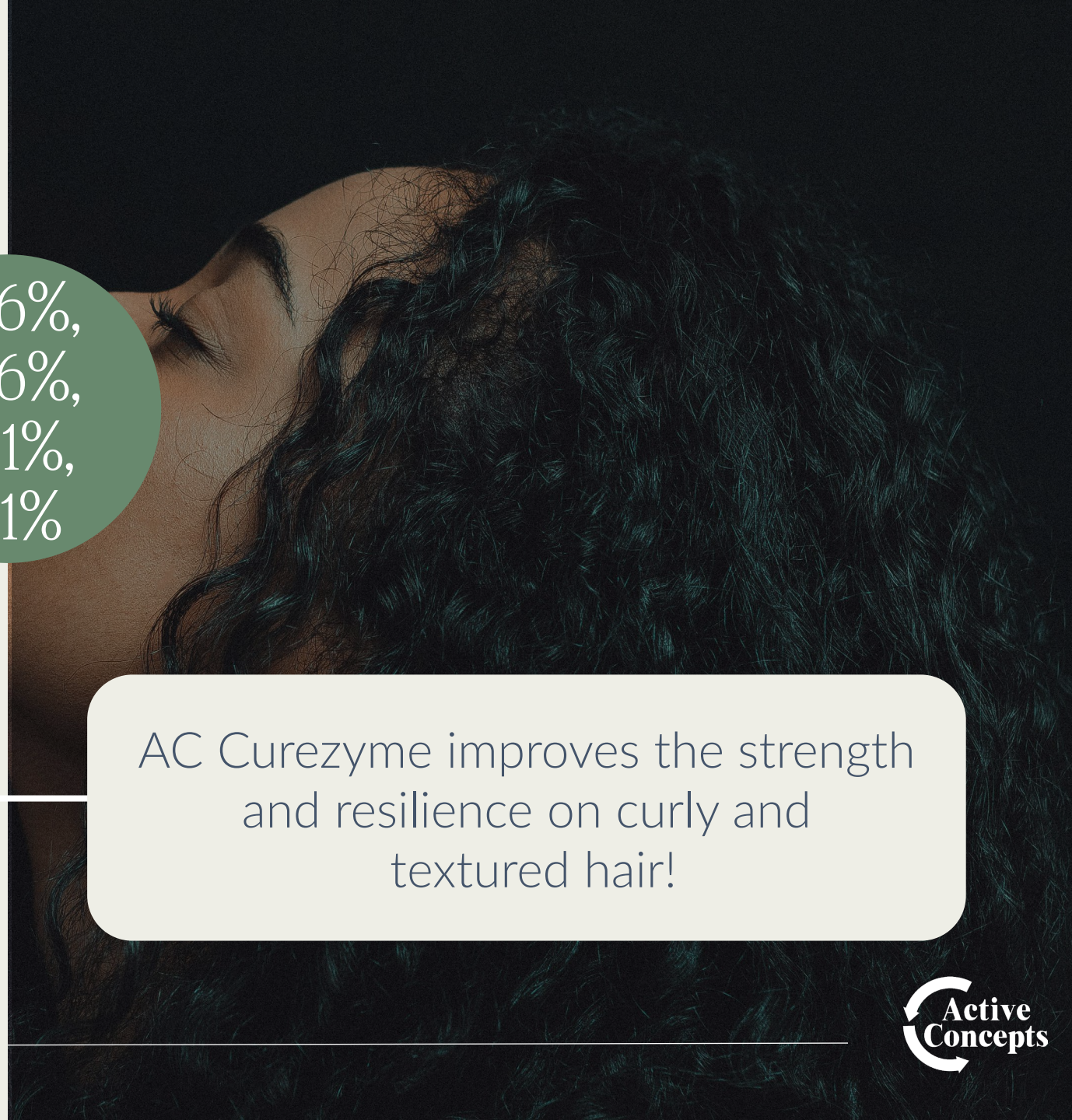

Figure 7. Curly Hair Tresses, Type 3B-Curly-Black. Top Left: Average Tensile Strength. Top Right: Average Percent Elongation. Botton Left: Average Tenacity. Bottom Right: Average Modulus of Elasticity.

AC Curezyme was tested for following parameters: (i) force to break: maximum force required to break each fiber, (ii) tenacity: the break strength of each fiber where an increase indicates fiber protection, (iii) fiber elongation: illustrated fiber deformation before breaking where lower values indicate stronger fibers, and (iv) modulus of elasticity: the ratio of change in stress to change in strain as a fraction of the original hair fiber where an increase indicates stronger hair fibers.

2.0% AC Curezyme increased the force to break, tenacity, and the modulus of elasticity, while simultaneously reducing fiber elongation, in curly hair tresses compared to the untreated baseline by:

+26%,
+26%,
+21%,
−11%

# Benefits



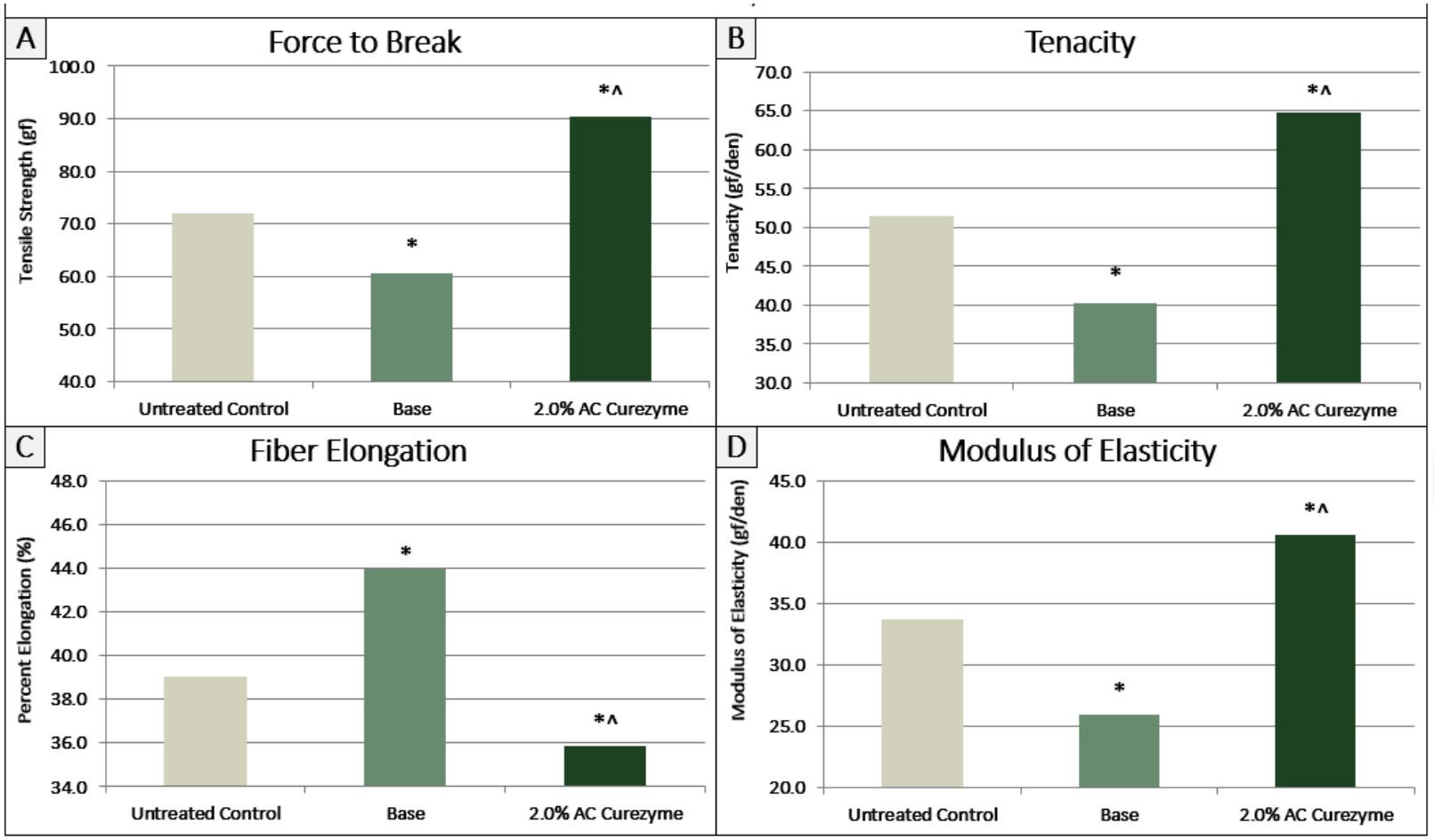
AC Curezyme improves the strength and resilience on curly and textured hair!

Active Concepts

# Tensile Strength

*The Strength.*

## 1B-Straight-Blonde




AC Curezyme was tested for following parameters: (i) force to break: maximum force required to break each fiber, (ii) tenacity: the break strength of each fiber where an increase indicates fiber protection, (iii) fiber elongation: illustrated fiber deformation before breaking where lower values indicate stronger fibers, and (iv) modulus of elasticity: the ratio of change in stress to change in strain as a fraction of the original hair fiber where an increase indicates stronger hair fibers.

Figure 8. Blonde Hair Tresses, Type 1B-Straight-Blonde. Top Left: Average Tensile Strength. Top Right: Average Percent Elongation. Botton Left: Average Tenacity. Bottom Right: Average Modulus of Elasticity.

2.0% AC Curezyme increased the force to break, tenacity, and the modulus of elasticity, while simultaneously reducing fiber elongation, in curly hair tresses compared to the untreated baseline by:

+30%,
+29%,
+21%,
−13%

# Benefits

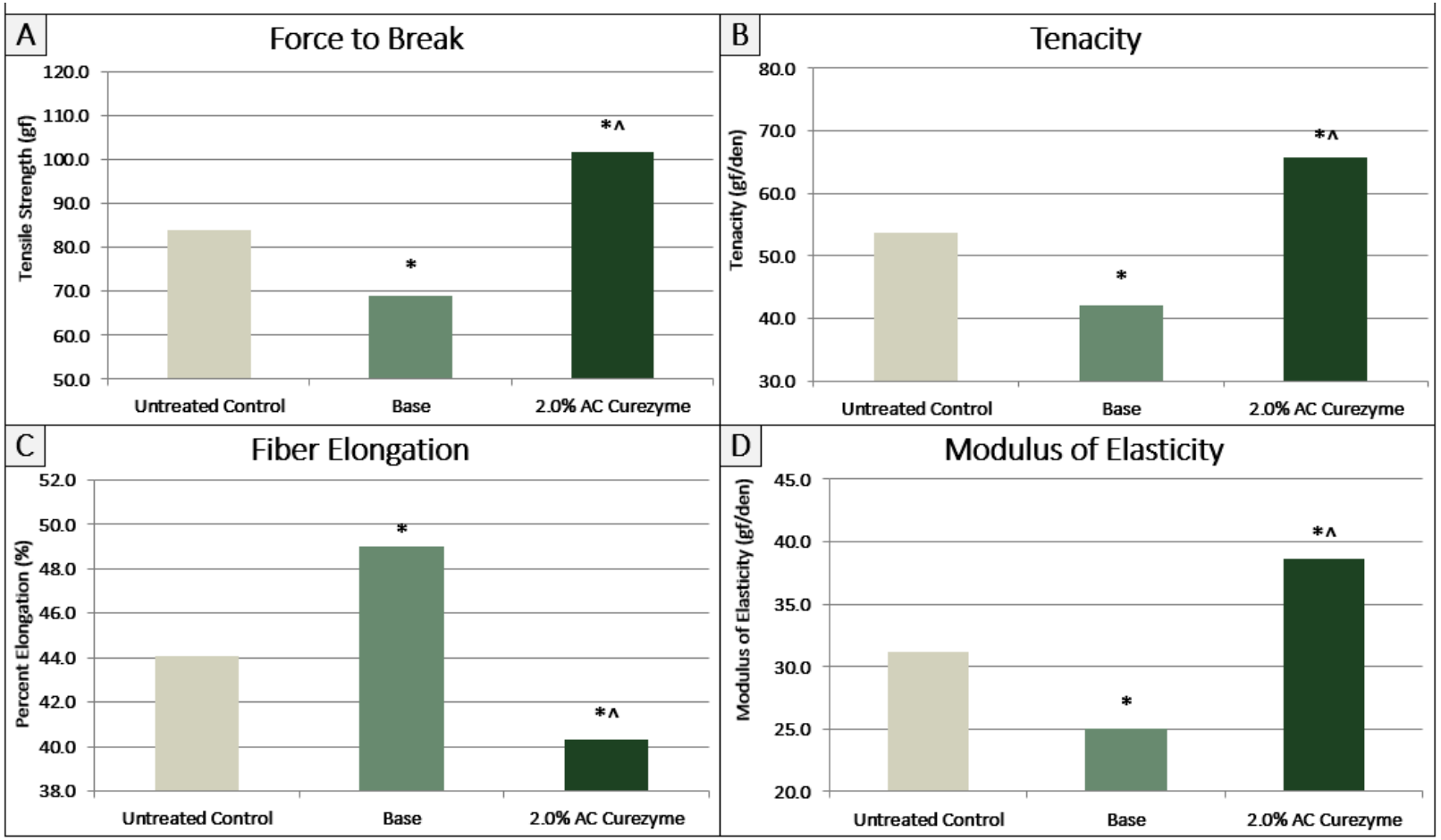
AC Curezyme improves the strength and resilience on finer, blonde hair!

Active Concepts

# Tensile Strength

*The Strength.*

# 2B-Wavy-Brunette



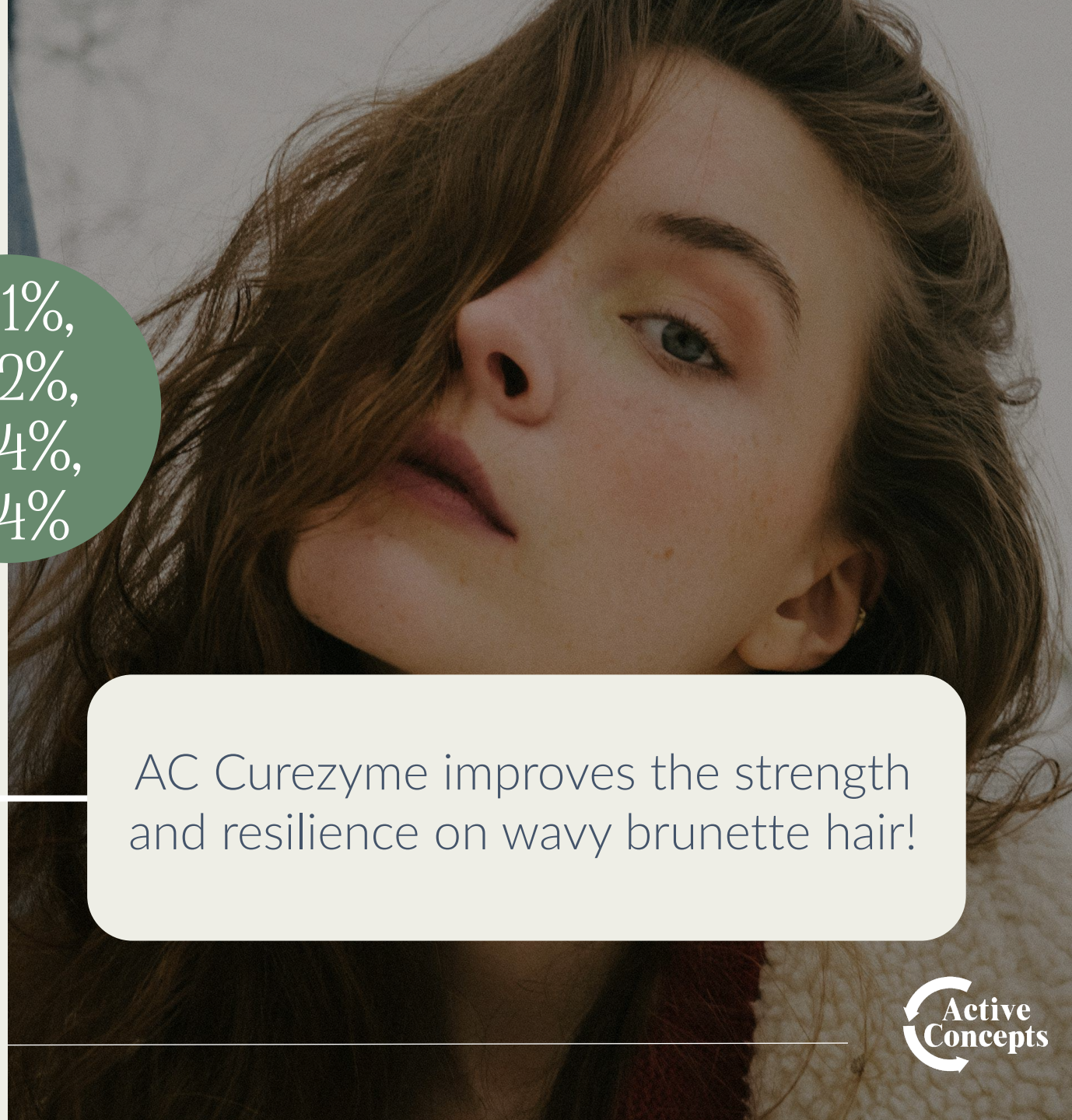

AC Curezyme was tested for following parameters: (i) force to break: maximum force required to break each fiber, (ii) tenacity: the break strength of each fiber where an increase indicates fiber protection, (iii) fiber elongation: illustrated fiber deformation before breaking where lower values indicate stronger fibers, and (iv) modulus of elasticity: the ratio of change in stress to change in strain as a fraction of the original hair fiber where an increase indicates stronger hair fibers.

Figure 9. Brunette Hair Tresses, Type 2B-Wavy-Brunette. Top Left: Average Tensile Strength. Top Right: Average Percent Elongation. Botton Left: Average Tenacity. Bottom Right: Average Modulus of Elasticity.

2.0% AC Curezyme increased the force to break, tenacity, and the modulus of elasticity, while simultaneously reducing fiber elongation, in curly hair tresses compared to the untreated baseline by:

+21%,
+22%,
+24%,
–14%

# Benefits



AC Curezyme improves the strength and resilience on wavy brunette hair!

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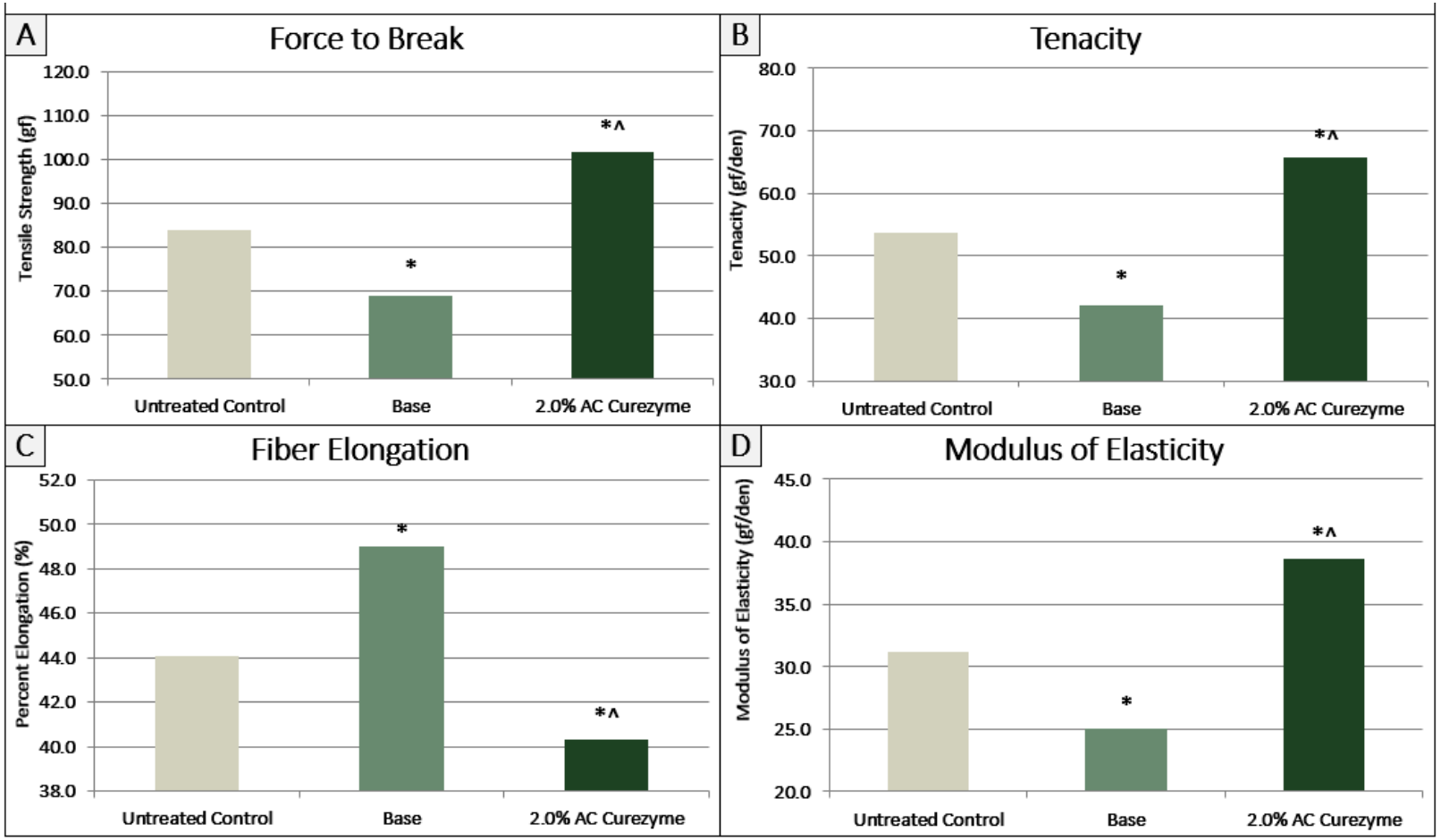
# Tensile Strength

*The Strength.*

## 1C-Straight-Black




AC Curezyme was tested for following parameters: (i) force to break: maximum force required to break each fiber, (ii) tenacity: the break strength of each fiber where an increase indicates fiber protection, (iii) fiber elongation: illustrated fiber deformation before breaking where lower values indicate stronger fibers, and (iv) modulus of elasticity: the ratio of change in stress to change in strain as a fraction of the original hair fiber where an increase indicates stronger hair fibers.

Figure 10. Asian Hair Tresses, Type 1B-Straight-Black. Top Left: Average Tensile Strength. Top Right: Average Percent Elongation. Botton Left: Average Tenacity. Bottom Right: Average Modulus of Elasticity.

2.0% AC Curezyme increased the force to break, tenacity, and the modulus of elasticity, while simultaneously reducing fiber elongation, in curly hair tresses compared to the untreated baseline by:

+17%,
+22%,
+24%,
−11%

# Benefits

AC Curezyme improves the strength and resilience on Asian hair!

Active Concepts

# Salon Half-Head

*The Performance vs. Base*


Figure 11. Participant Images Before Shampoo and Conditioner Application and After Blow Drying.

A Salon Half-Head Study evaluated the performance of 2.0% AC Curezyme in shampoo and conditioner on five volunteers. One half of each participant's hair was treated with a base formula, while the other half received the same formula with AC Curezyme. Wet and dry sensory assessments were conducted, along with before-and-after photography. Results were statistically analyzed to determine perceived improvements in hair condition.

Active Concepts

2% AC Curezyme increased overall feel and anti-frizz benefits when compared to the base by

+17% & +24%

# Benefits

AC Curezyme transforms the haircare experience from just your base shampoo and conditioner formula.

Active Concepts

# Salon Half-Head

*The Performance vs. Protein*


Figure 12. Participant Images Before Shampoo and Conditioner Application and After Blow Drying.

A Salon Half-Head Study evaluated the performance of 2.0% AC Curezyme in shampoo and conditioner on five volunteers. One half of each participant's hair was treated with AC Hydrolyzed Vegetable Protein PF, while the other half received the same formula with AC Curezyme. Wet and dry sensory assessments were conducted, along with before-and-after photography. Results were statistically analyzed to determine perceived improvements in hair condition.

Active Concepts

2% AC Curezyme increased hydration and shine benefits when compared to AC Hydrolyzed Vegetable Protein PF by

+23%
&
+33%

# Benefits

AC Curezyme enhances the benefits imparted by protein activity on the hair for longer-lasting benefits.

Active Concepts

# Salon Half-Head

*The Performance vs. Plant-Based Quat*

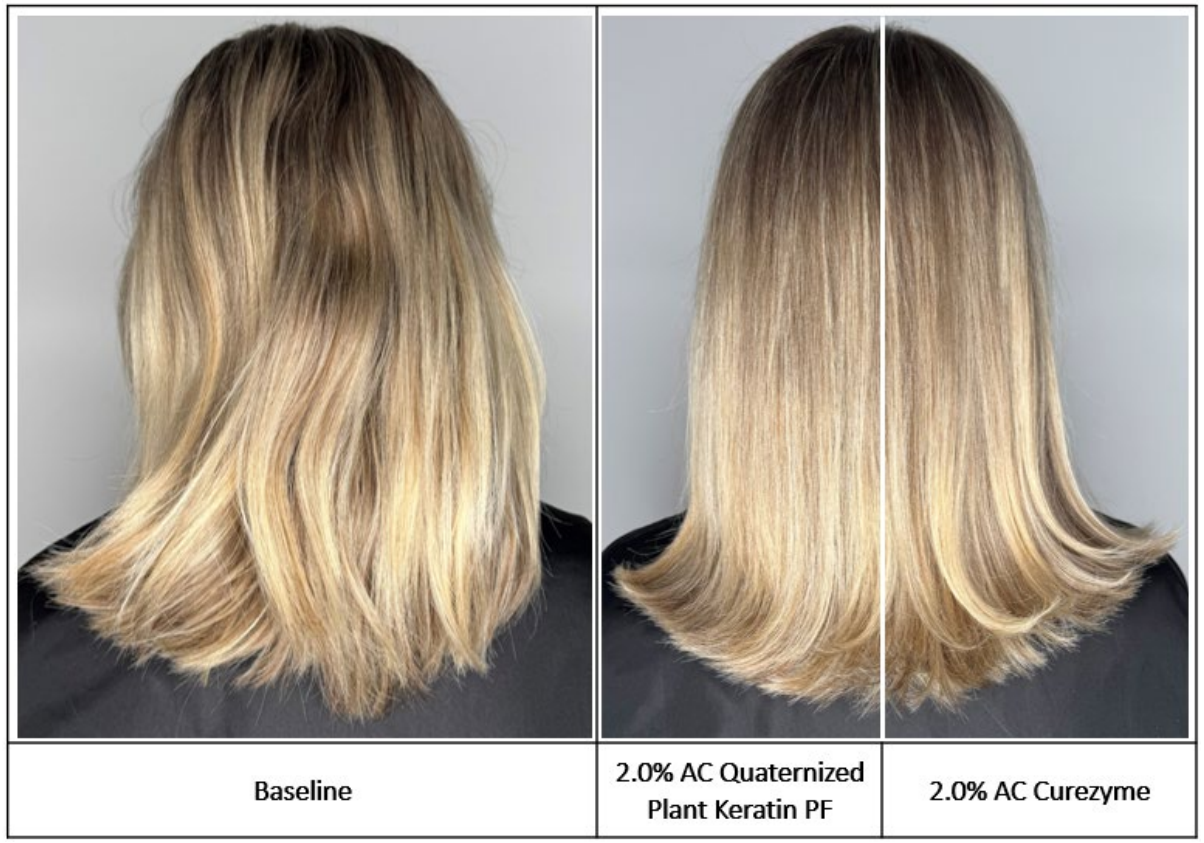



Figure 13. Participant Images Before Shampoo and Conditioner Application and After Blow Drying.

A Salon Half-Head Study evaluated the performance of 2.0% AC Curezyme in shampoo and conditioner on five volunteers. One half of each participant's hair was treated with AC Quaternized Plant Keratin PF, while the other half received the same formula with AC Curezyme. Wet and dry sensory assessments were conducted, along with before-and-after photography. Results were statistically analyzed to determine perceived improvements in hair condition.

2% AC Curezyme increased overall feel and anti-frizz benefits when compared to AC Quaternized Plant Keratin PF by

+26%
&
+20%

# Benefits

AC Curezyme outperforms traditional quaternized proteins, improving the overall haircare experience .

Active Concepts

# Market Applications

## "Frizzproof Finish" Leave-In Shield Cream

Concept: A weightless cream that smooths the cuticle, reinforces internal structure, and locks out humidity for long-lasting style control, powered by AC Curezyme.
Target: City dwellers, travelers, and naturally curly hair types.
Trend Tie-In: Climate-proof haircare meets functional wellness.

## "Overnight Rehab" Repair Milk

Concept: A lightweight, no-rinse overnight treatment that uses AC Curezyme to restore protein, smooth texture, and prep for styling the next day.
Target: Busy consumers seeking effortless hair repair while they sleep.
Trend Tie-In: Skinification of hair meets time-smart care.

## "Weightless Waves" Air-Dry Enhancer

Concept: A non-crunchy styling cream that defines curls and waves with internal reinforcement instead of surface coating, thanks to AC Curezyme.
Target: Minimalists who avoid heat styling and love low-effort beachy texture.
Trend Tie-In: Heatless styling + effortless aesthetics.

Active Concepts

# Summary

**WHAT.**

AC Curezyme represents innovation for the **post-quat market**. This advanced enzyme-to-protein ratio offers next generation technology tailored for the evolving consumer.

**WHY.**

AC Curezyme is more than just a conditioning agent, but effectively deposits **bioactive strength**, **weightless protection**, and is ideal for **all hair types**.

**MADE OF.**

AC Curezyme tailors **Curamina®**, a dual-action bioactive that creates essential peptide bonds by linking lysine and glutamine, to optimally enhance the activity of **AC Hydrolyzed Vegetable Protein PF**, a plant-derived alternative to traditional animal-based proteins.

**ACTION.**

This potent formula effectively bonds to hair strands without buildup, imparting conditioning benefits, frizz and style protection, and enhances the overall haircare experience.

# AC Curezyme

Active Concepts

**Code:** 20562

**Proposed INCI:** Vegetable Protein Keratinoligase
***CHI INCI:** Water & Hydrolyzed Vegetable Protein & Lactobacillus Ferment

**Appearance**: Clear to Slightly Hazy Liquid

**Suggested Use Level:** 2-5%

**Suggested Applications:** Hair Repair, Curl Retention, Frizz Control

**Standardized for:** Protein (Kjeldahl N x 6.25): 1.0 – 4.0%

Ex Vivo

In Vivo

Vegan Compliant

*China Compliant Version Available

Product Passport

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